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Suzuki

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(54) **ROTARY UNIT APPARATUS AND ROTATION SUPPORTING APPARATUS**

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F16M 11/18 (2006.01)

(52) **U.S. Cl.**
CPC ***F16M 11/18*** (2013.01); ***F16M 11/08*** (2013.01)

(58) **Field of Classification Search**
CPC F16M 11/08; F16M 11/18
USPC 248/125.7
See application file for complete search history.

(56) **References Cited**

FOREIGN PATENT DOCUMENTS

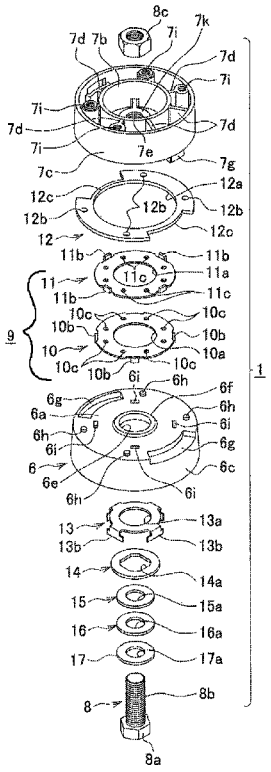
JP 2006-227390 A 8/2006

Primary Examiner — Michael Safavi
(74) *Attorney, Agent, or Firm* — Griffin and Szipl PC

(57) **ABSTRACT**

To provide a rotary unit and a rotation support used for television, etc., with a simple structure, which can generate an adequate friction torque and has a strength enough to prevent an escape and fracture during its use, even if it is made of aluminum die-cast material or synthetic resin article, a lower interior cylindrical body and an upper interior cylindrical body are provided on an upper disc portion and a lower disc portion of a fixed cylindrical body and/or a rotary cylindrical body rotatably connected by a hinge shaft, and a reinforcing member is attached to the lower and the upper interior cylindrical bodies. The reinforcing member comprises an insertion hole in which the hinge shaft is inserted, wherein locking portions provided on a plurality of locking pieces (which are provided by folding the outer circumference portions) are locked by the lower and the upper interior cylindrical bodies.

14 Claims, 21 Drawing Sheets



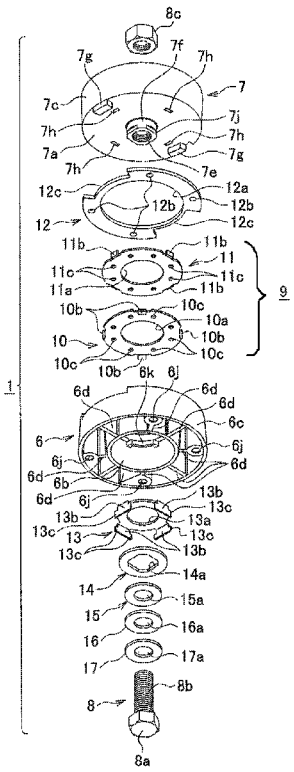


Fig. 1

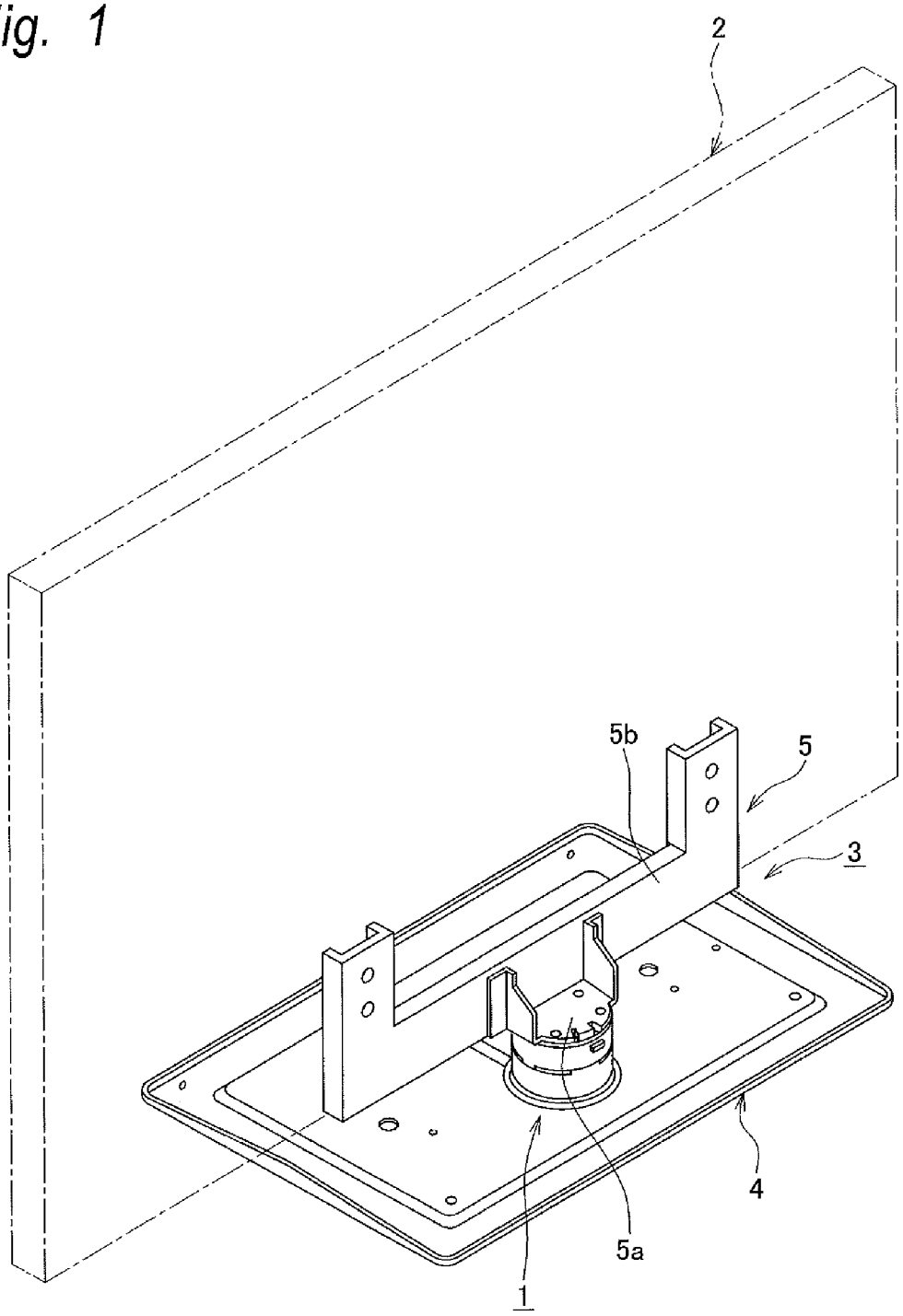


Fig. 2

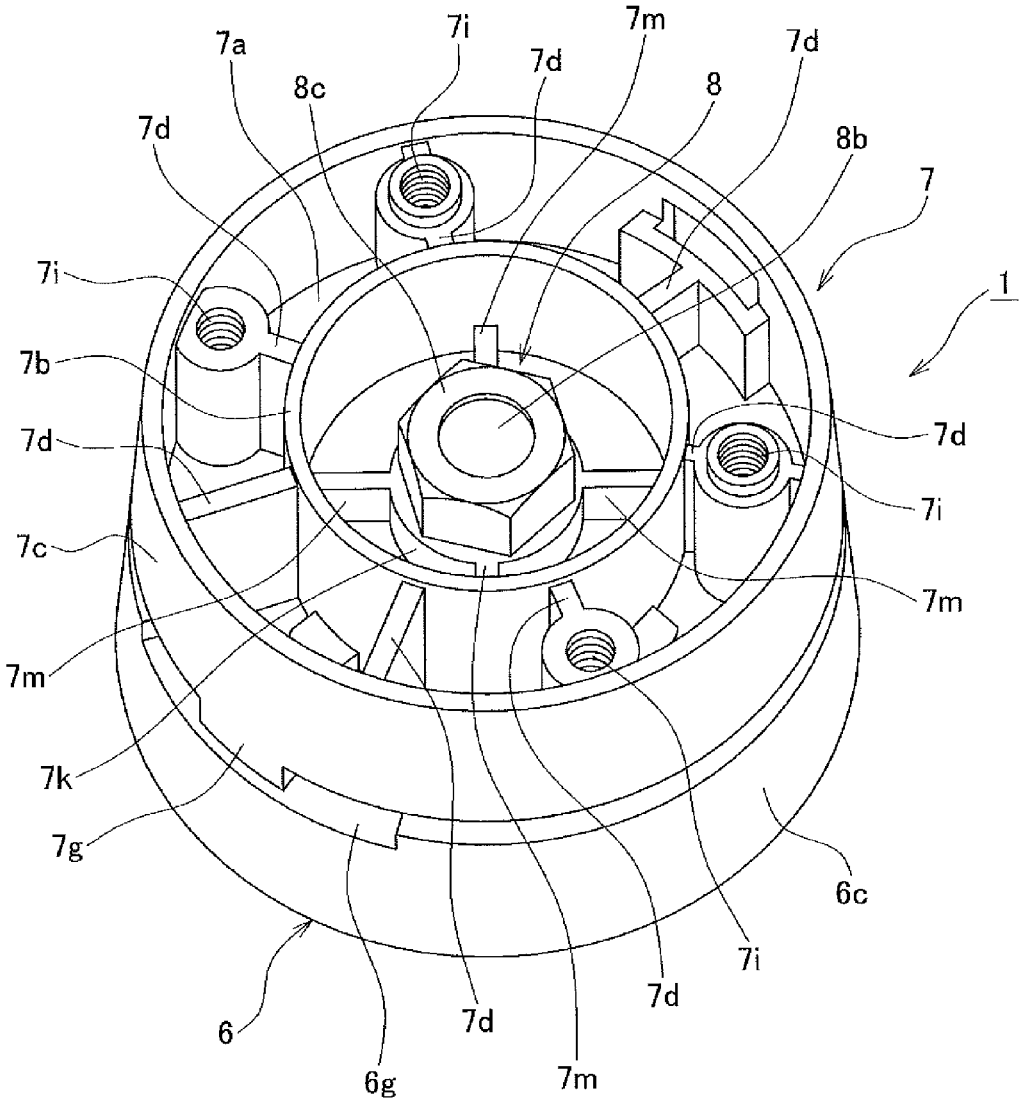

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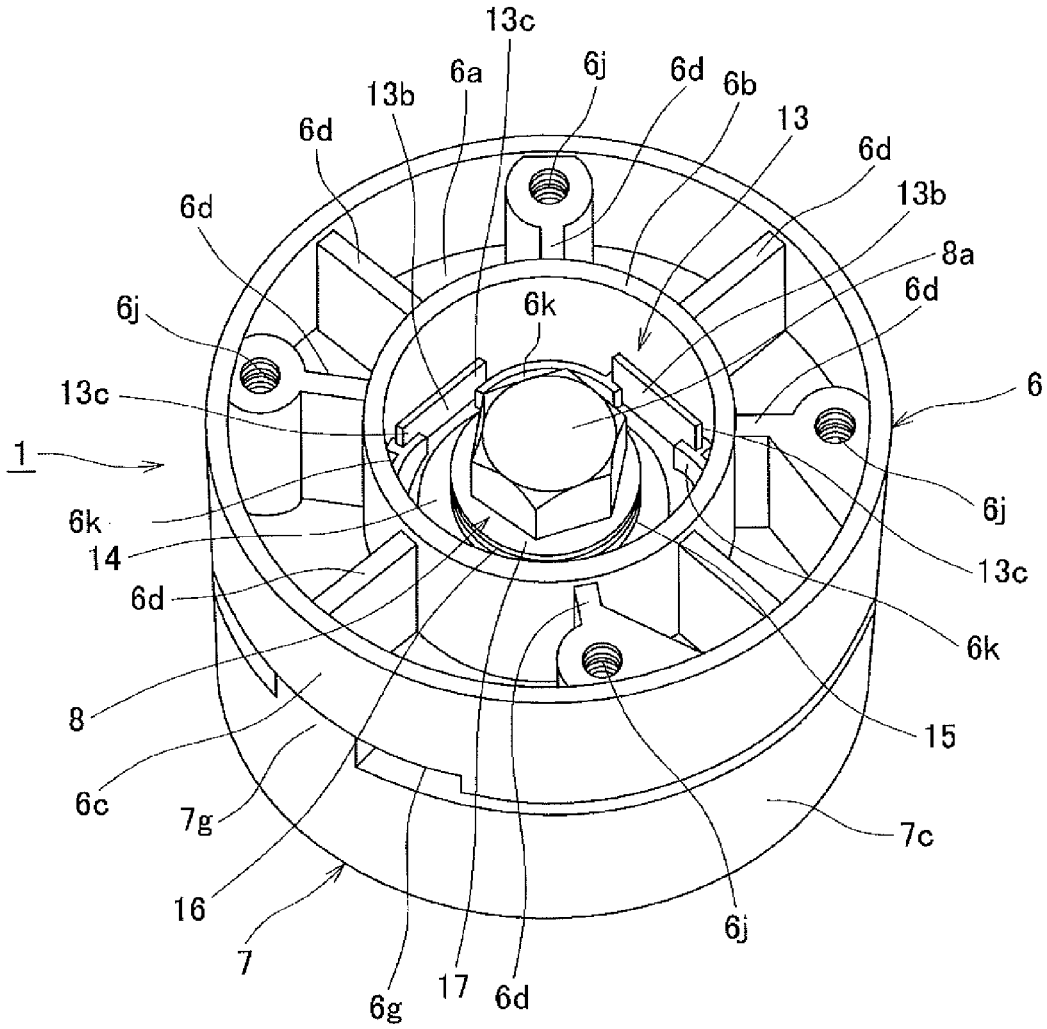
Fig. 3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6d

Fig. 4

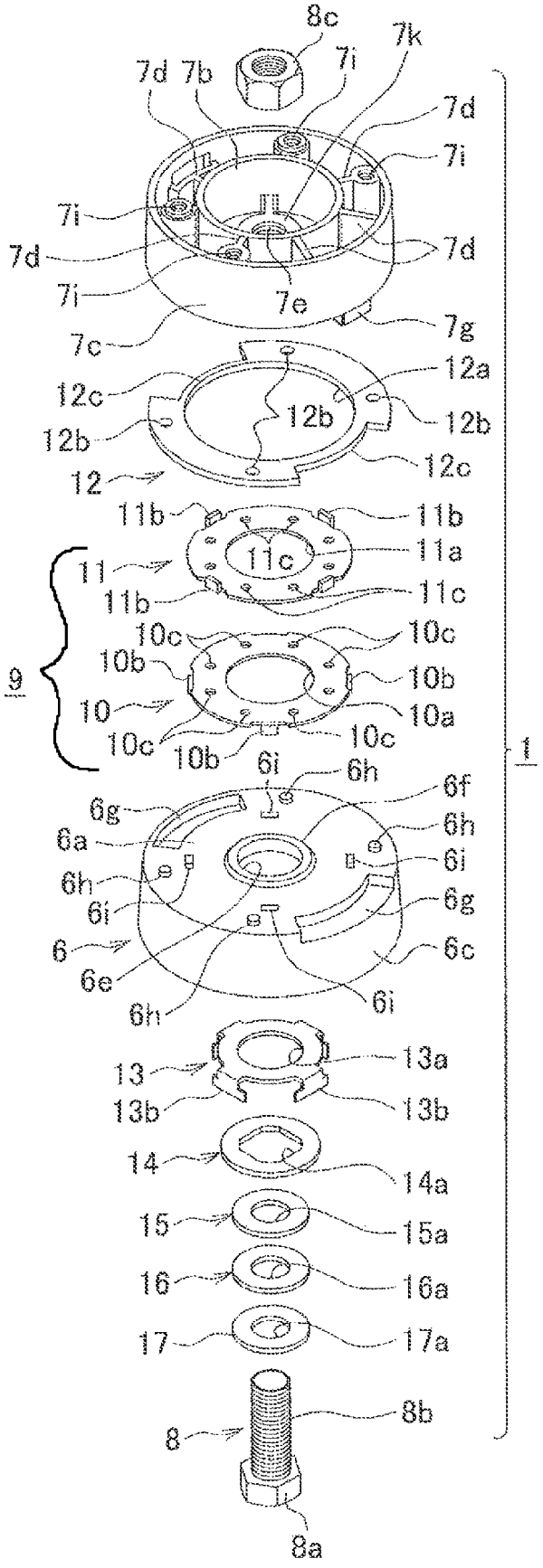
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Fig. 5

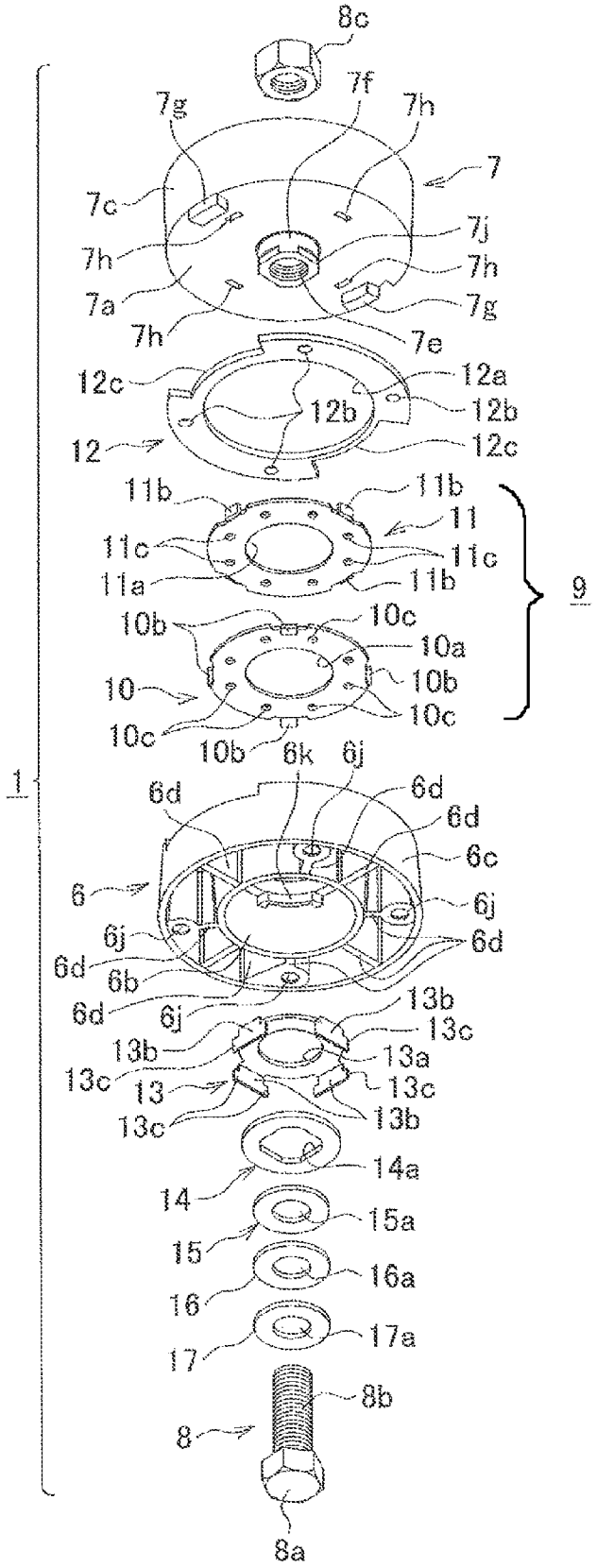
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Fig. 6A

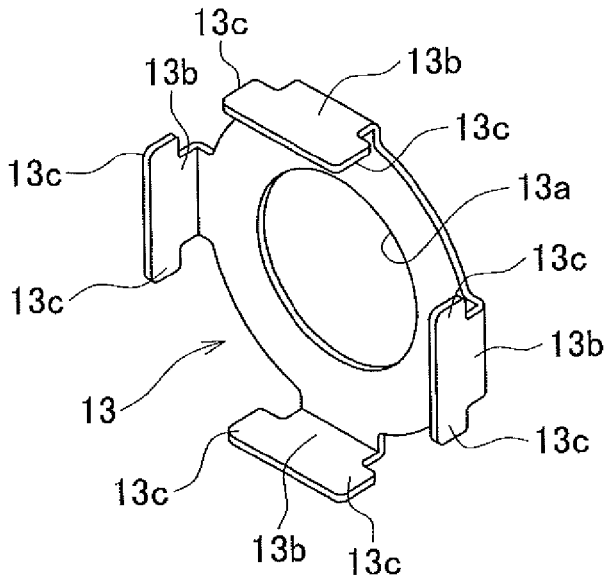
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Fig. 6B

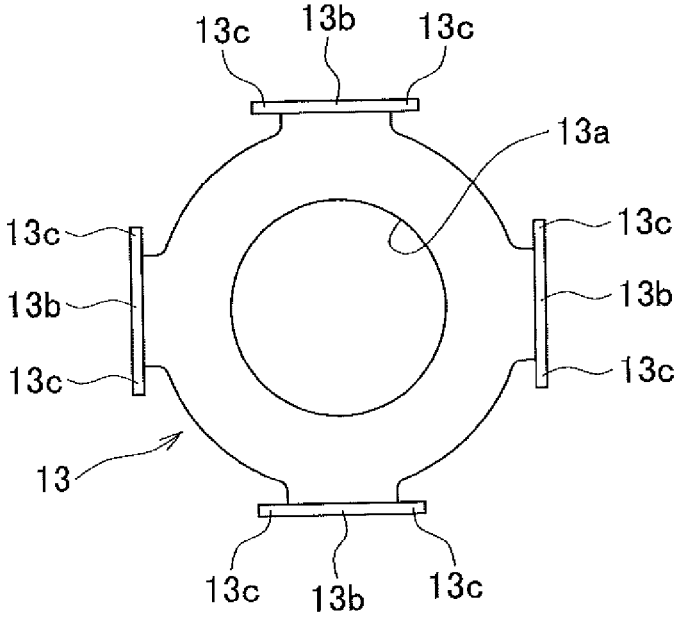
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Fig. 7

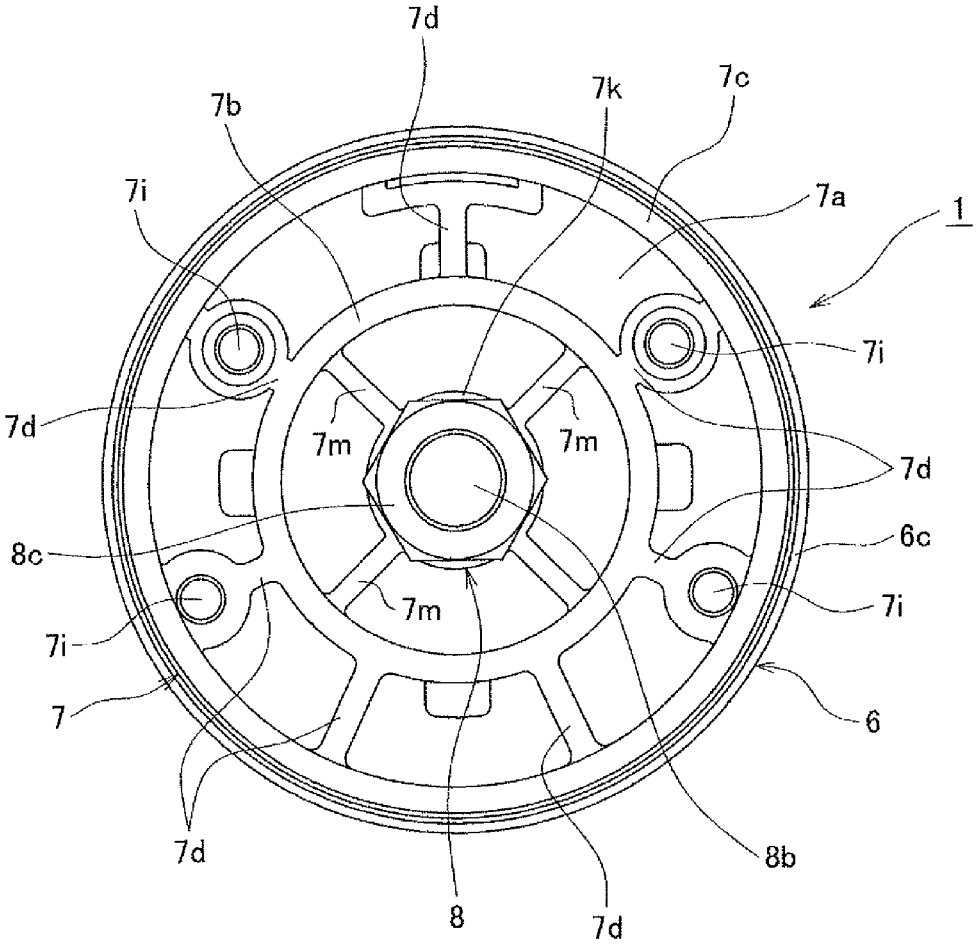

Fig. 8

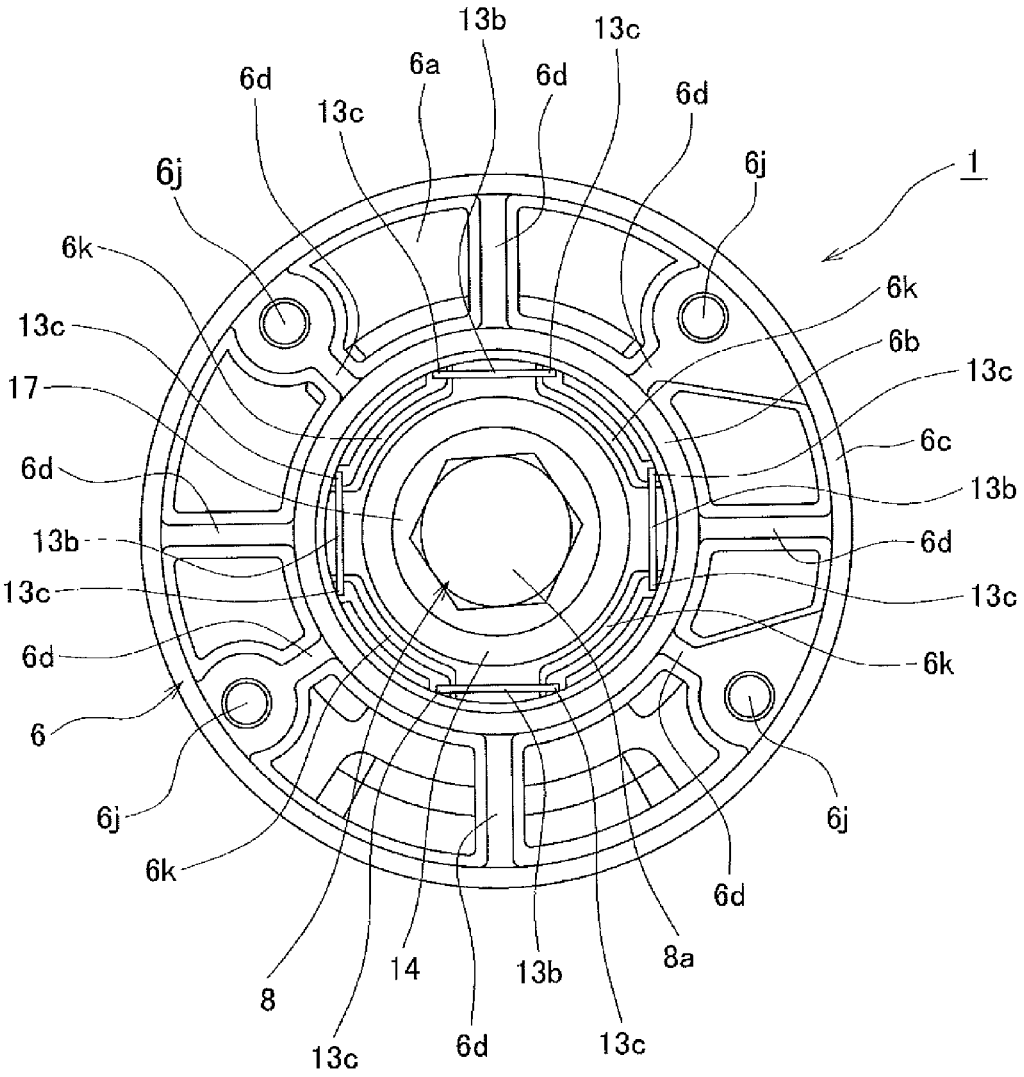
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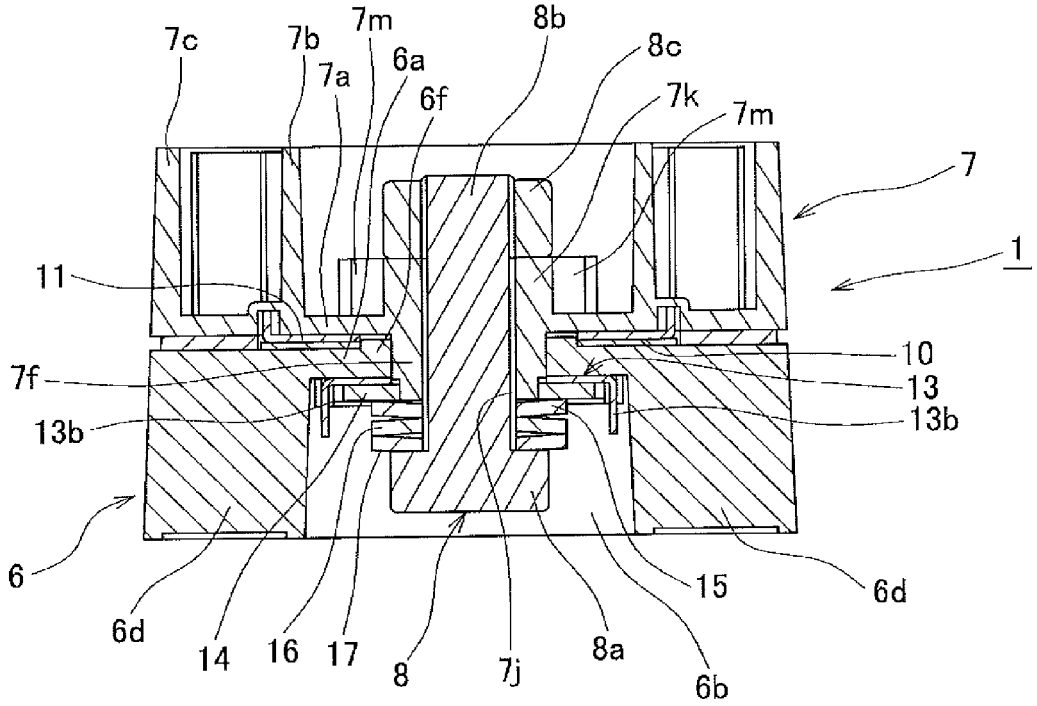
Fig. 9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6b

Fig. 10

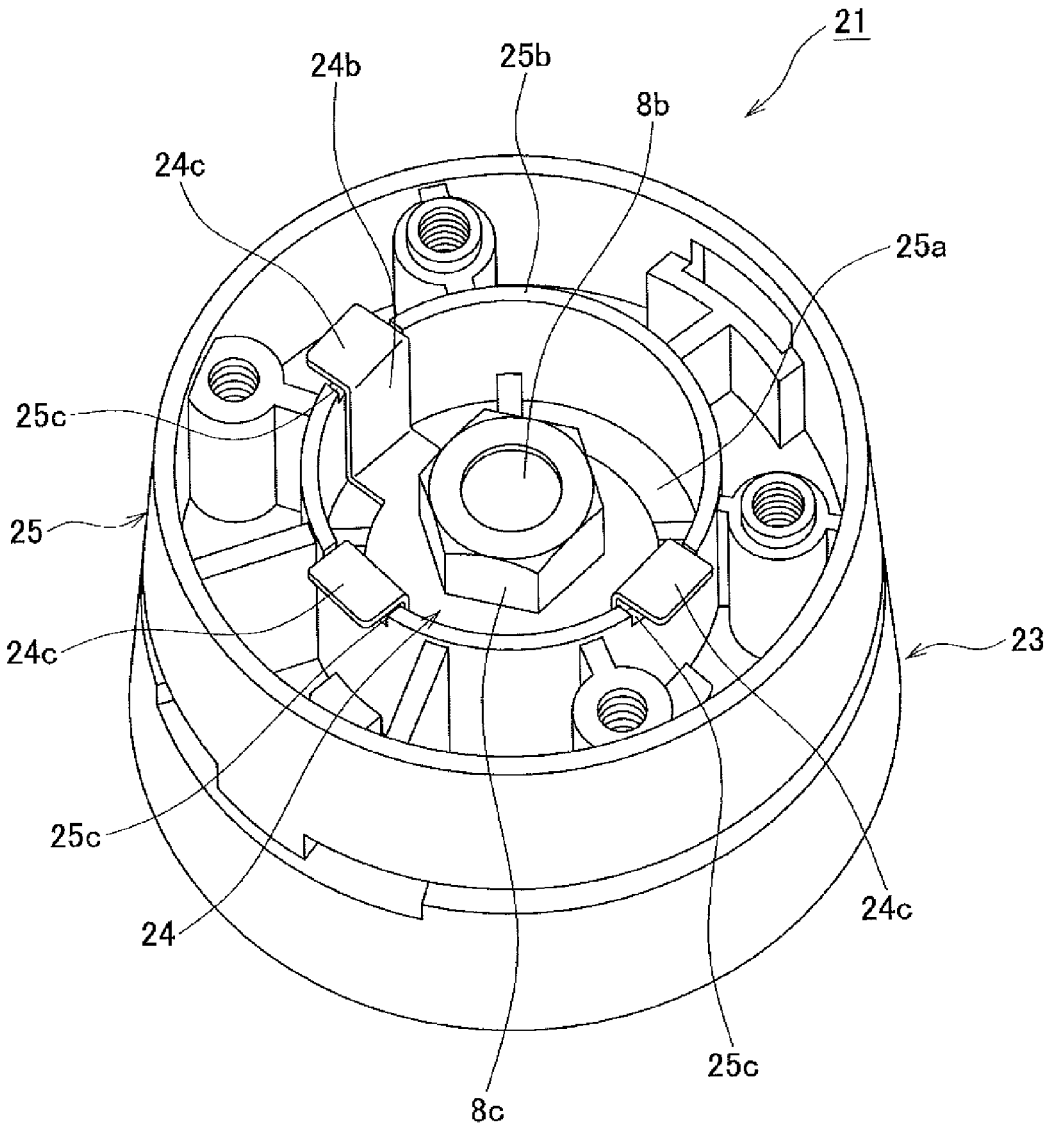
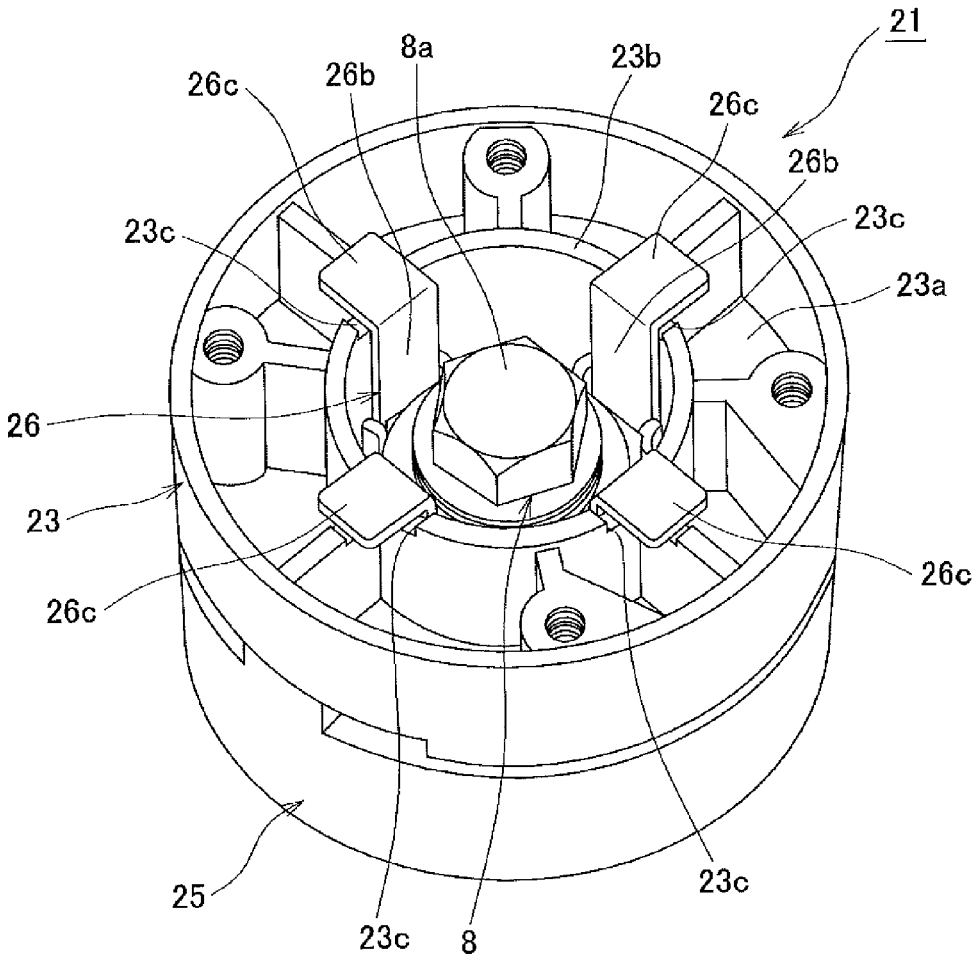


Fig. 11



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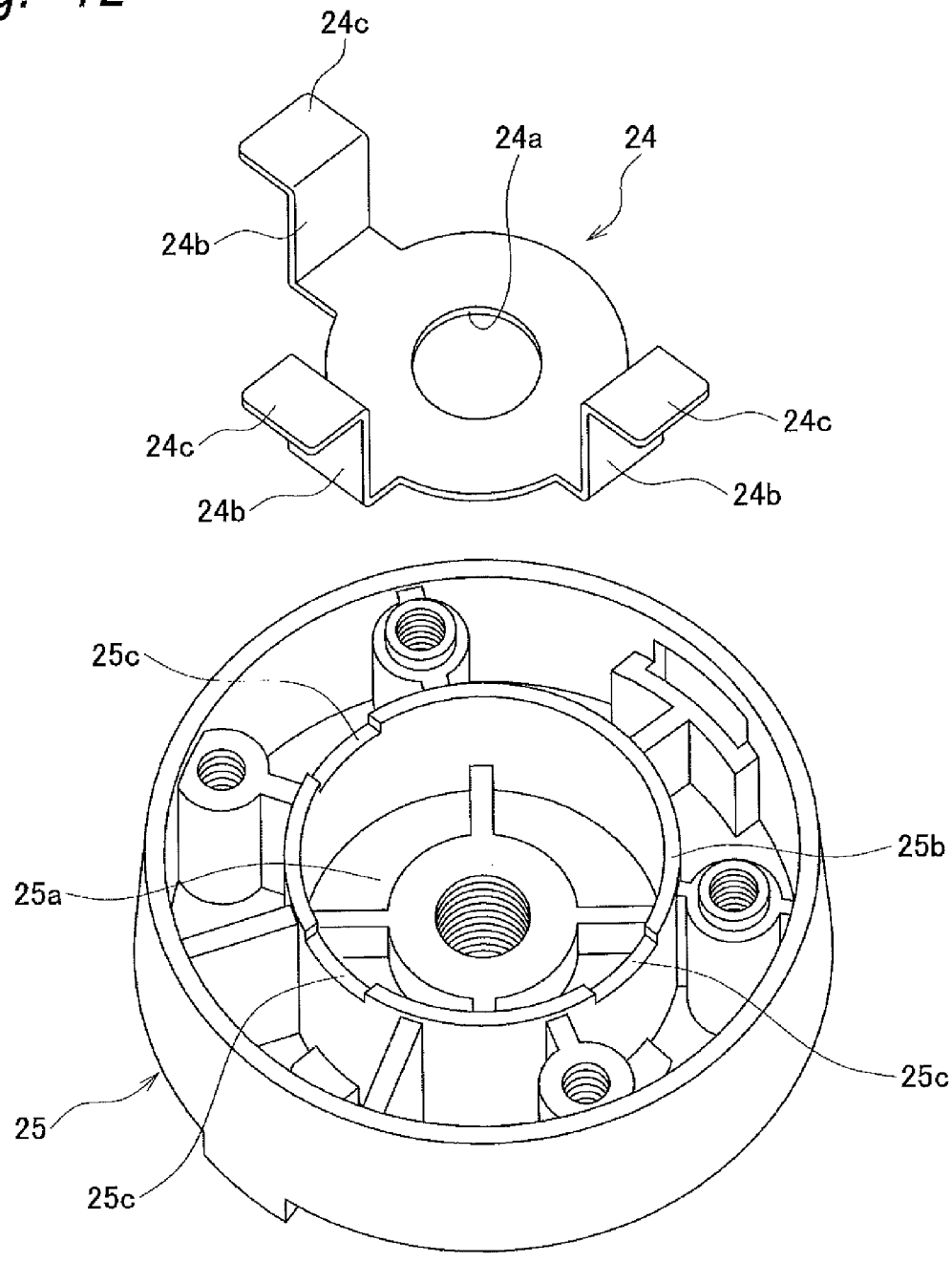

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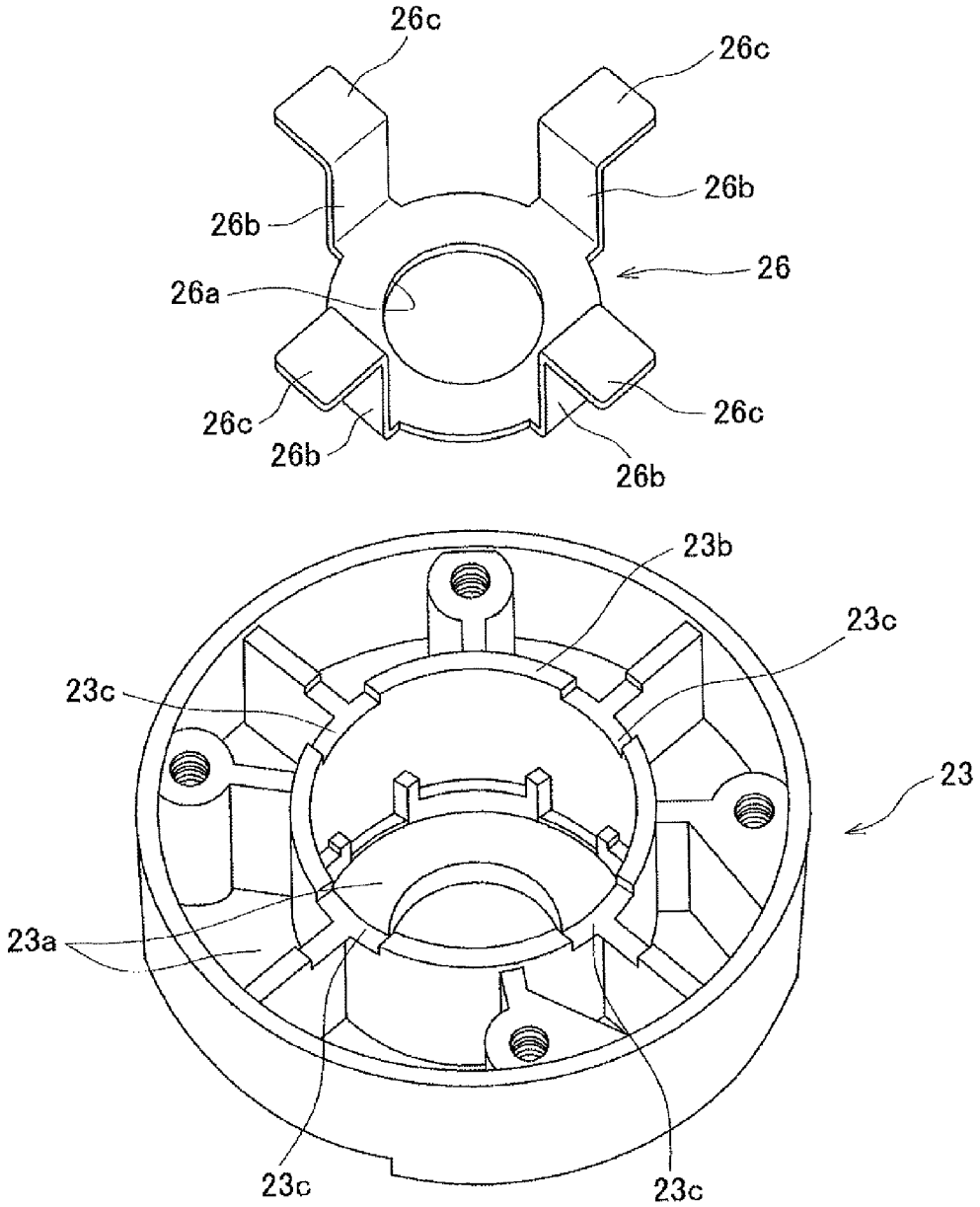

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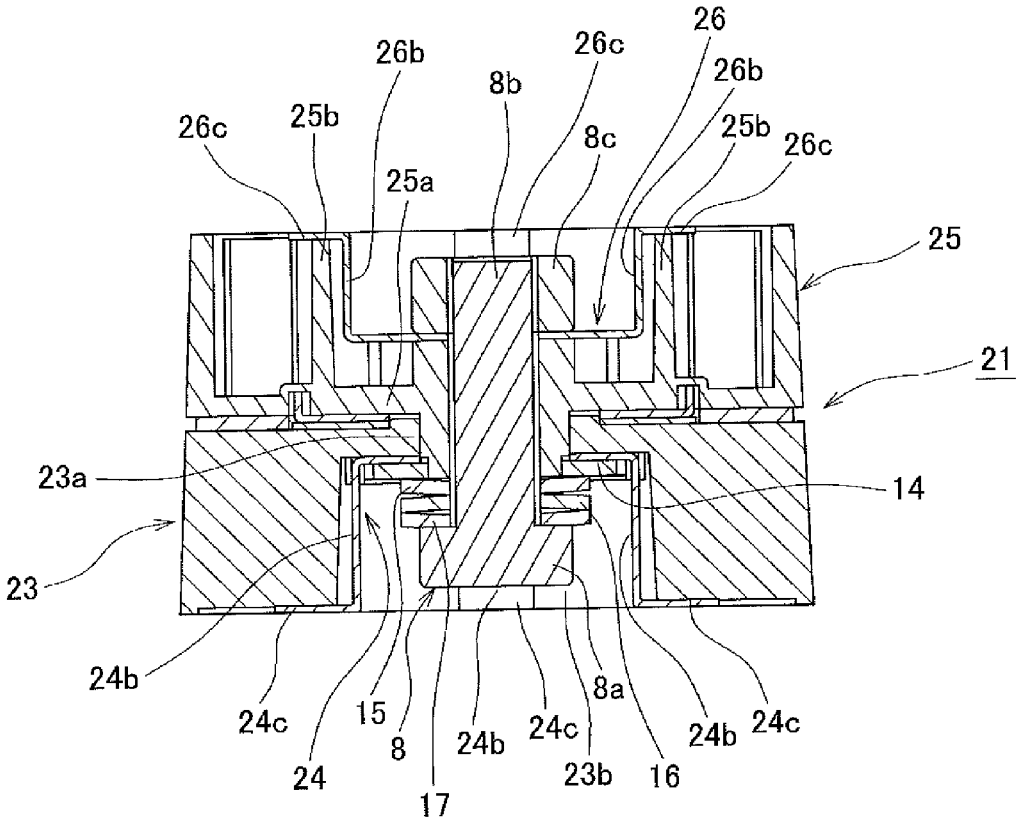
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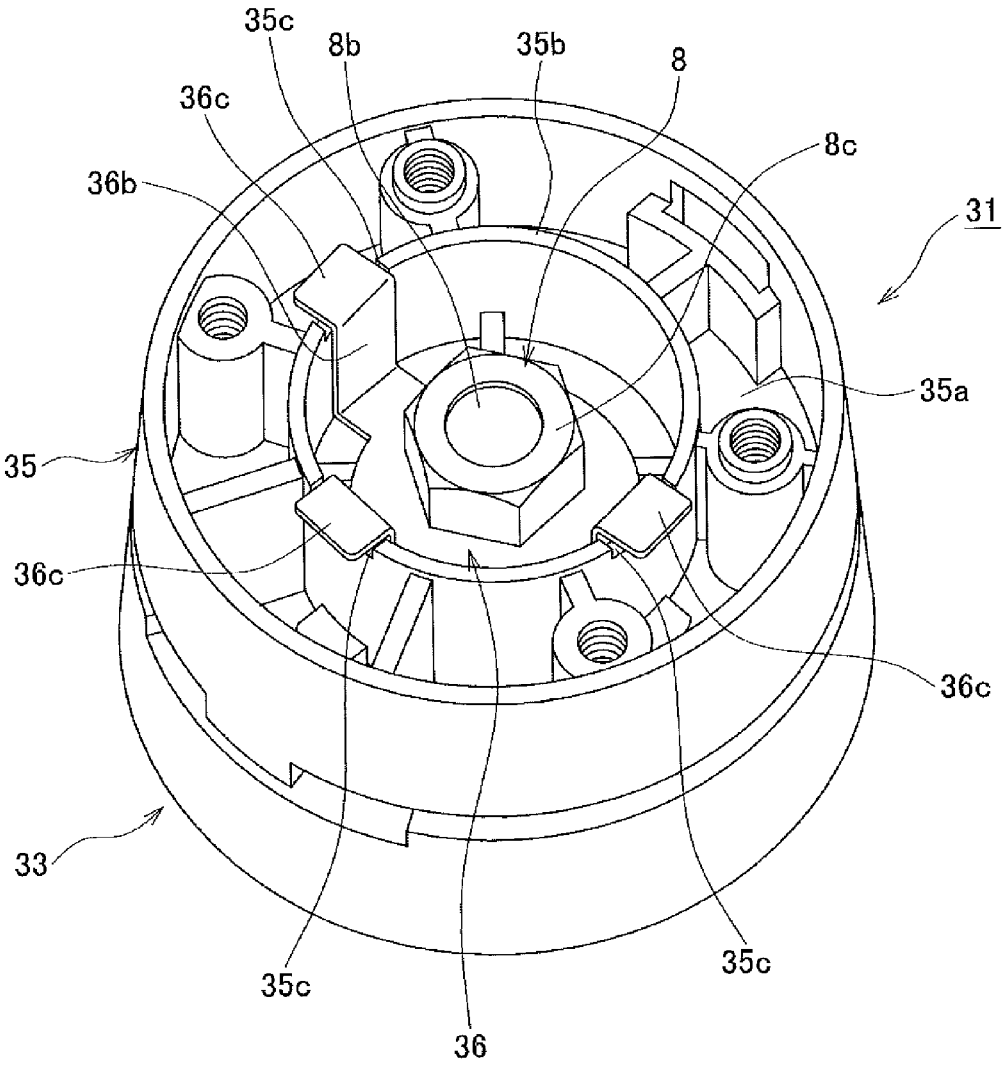
Fig. 15



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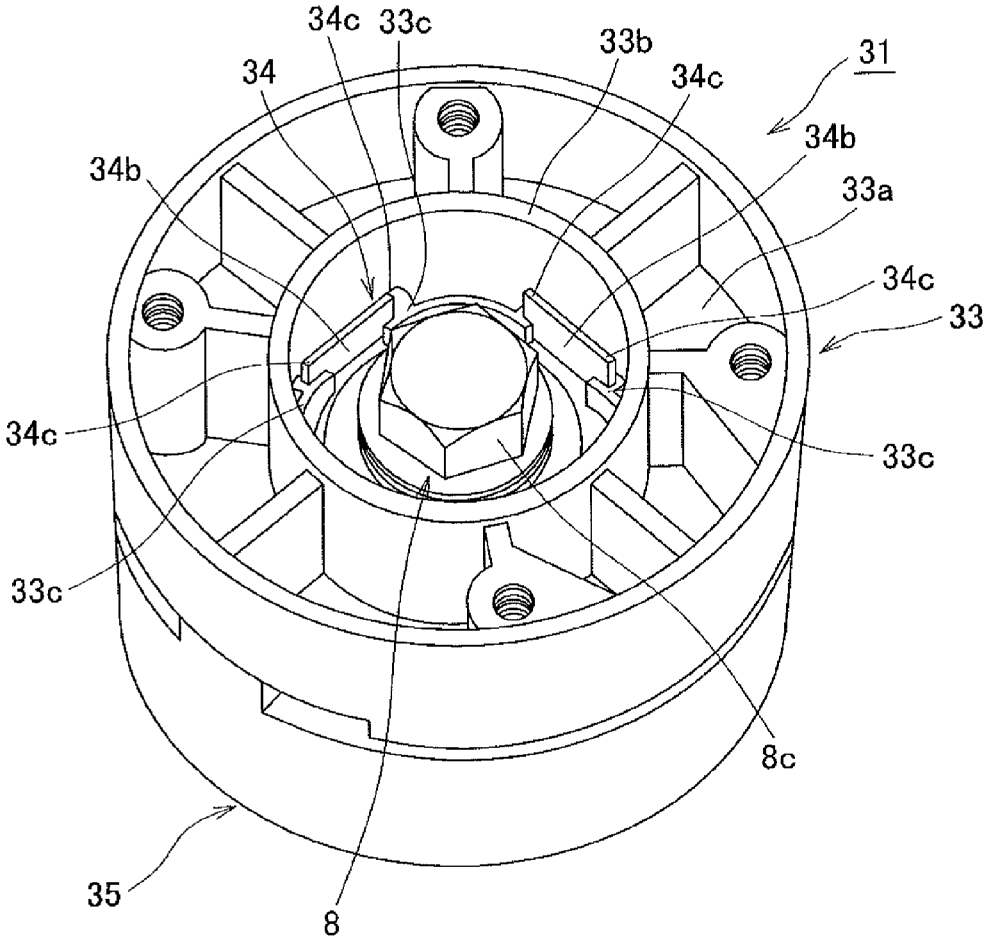

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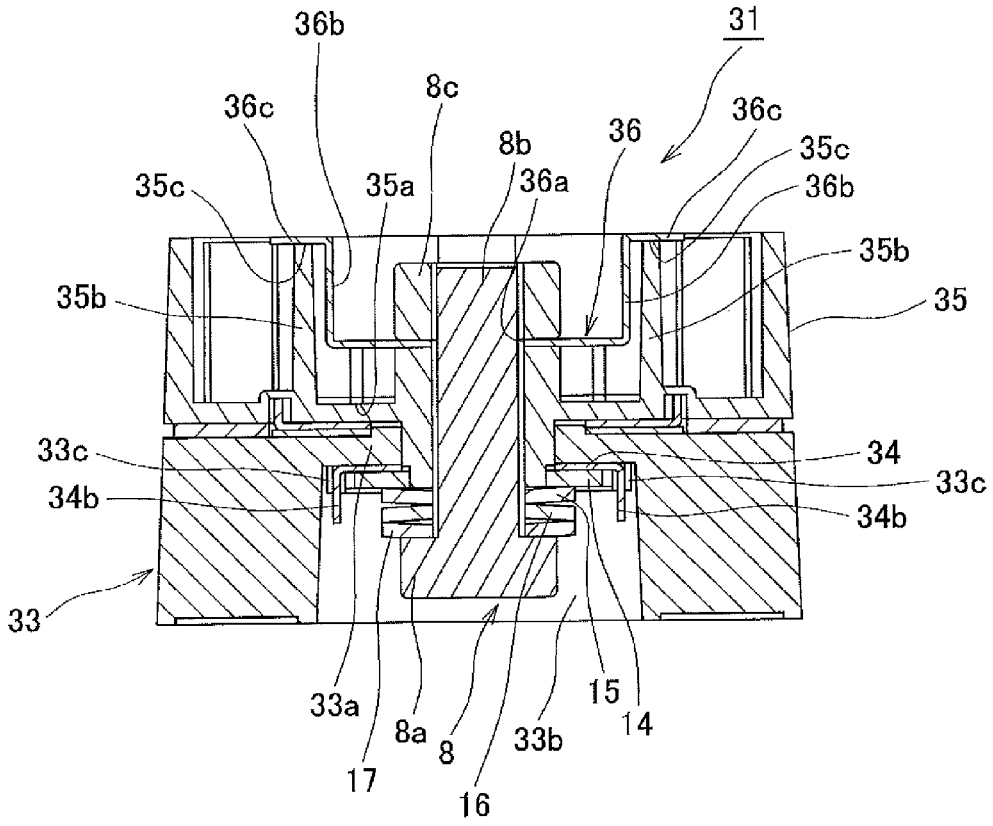
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Fig. 18

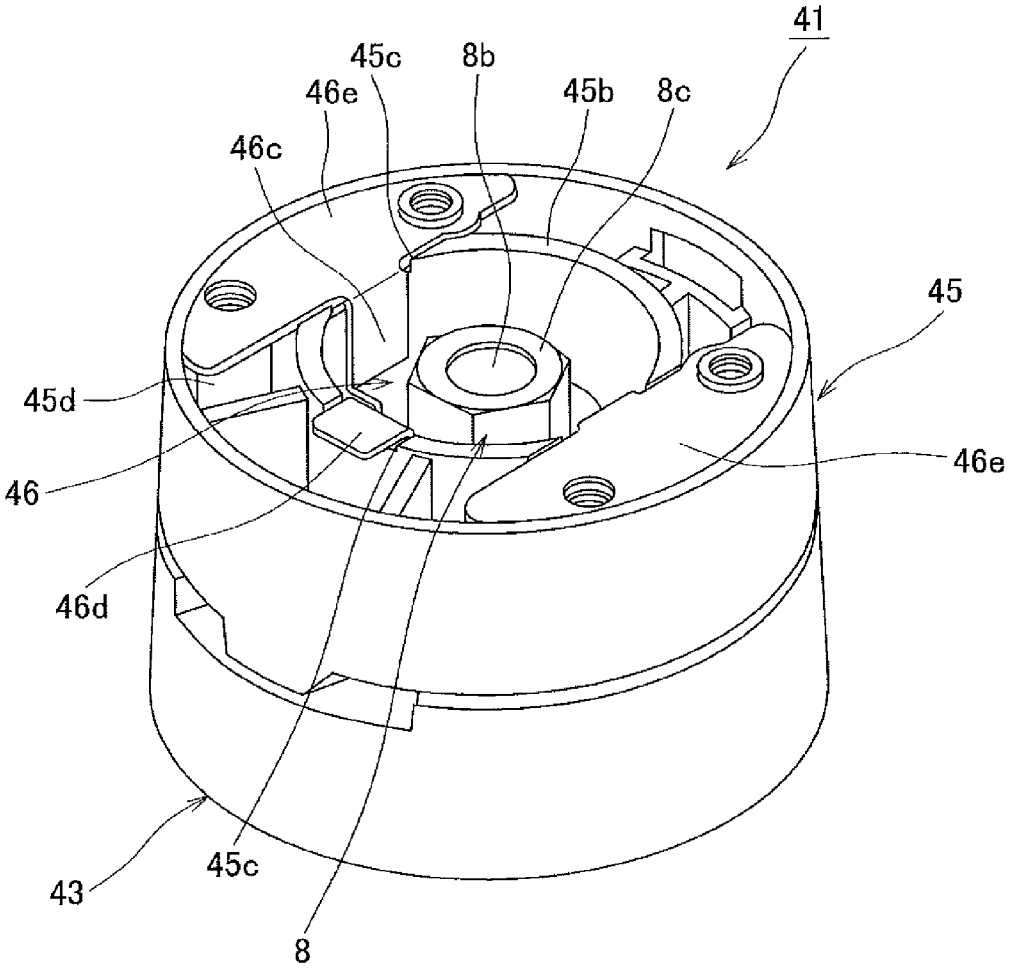

Fig. 19

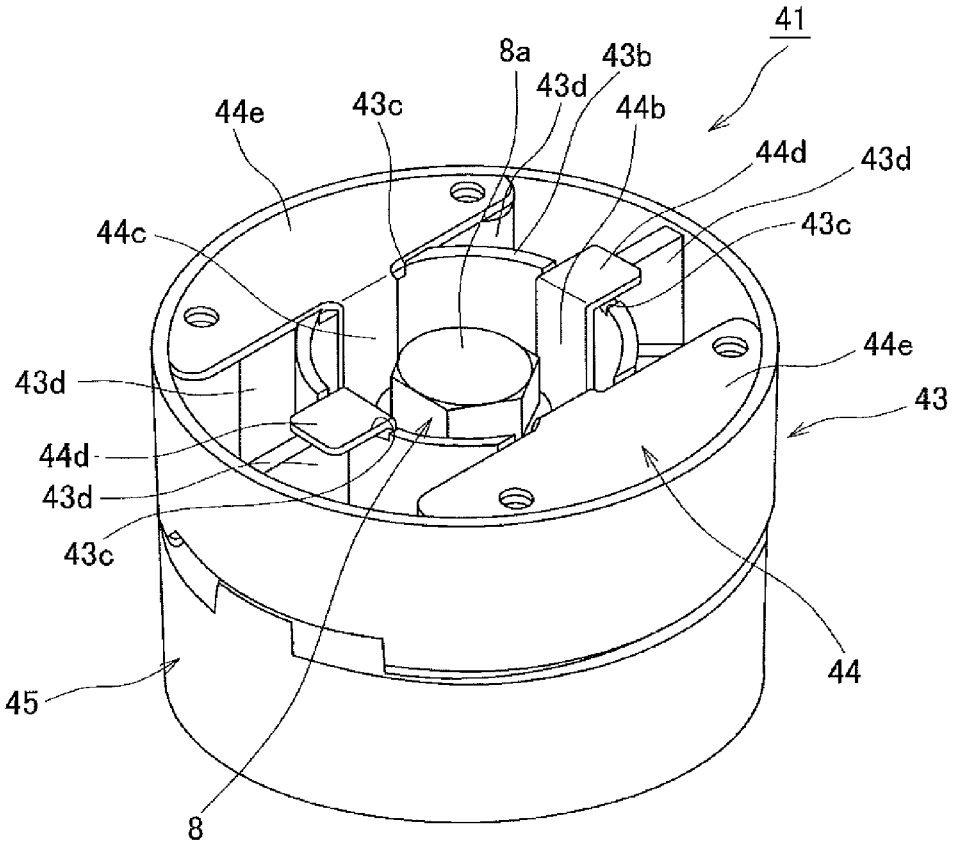
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Fig. 20

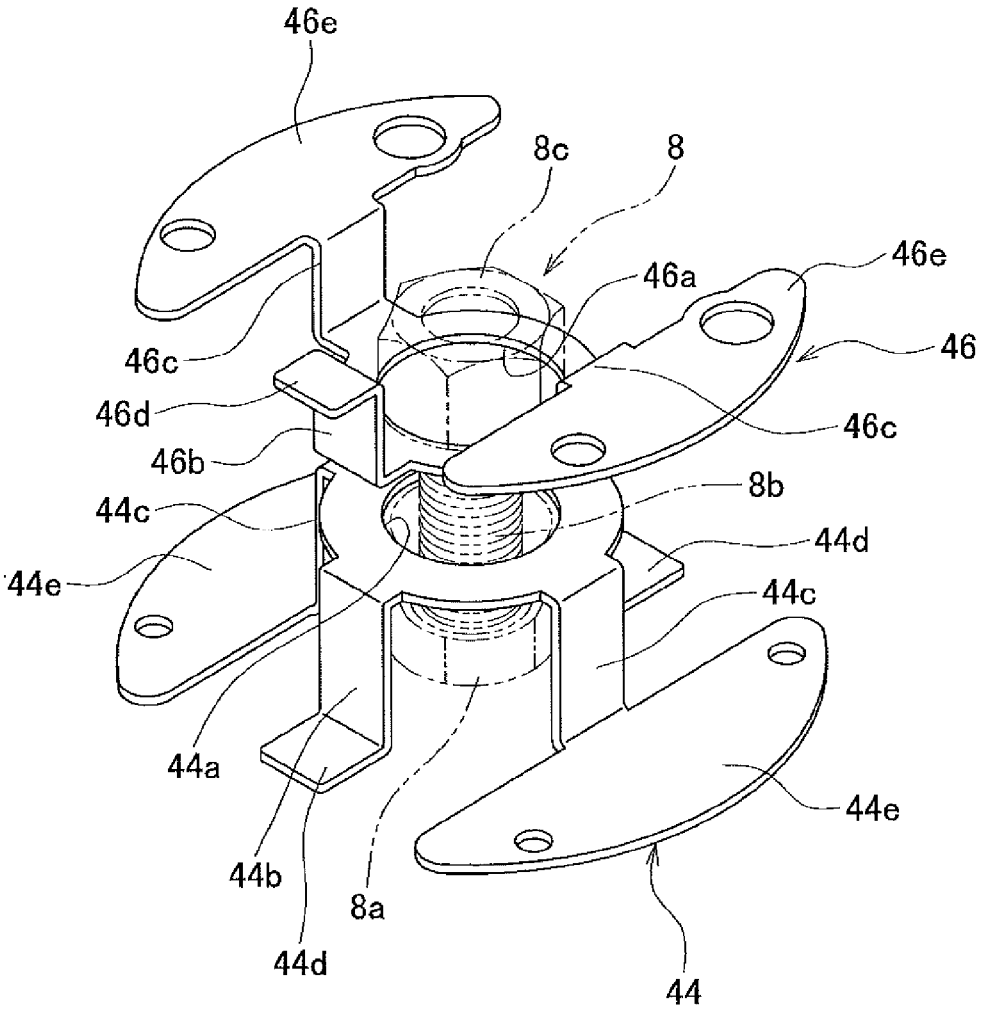
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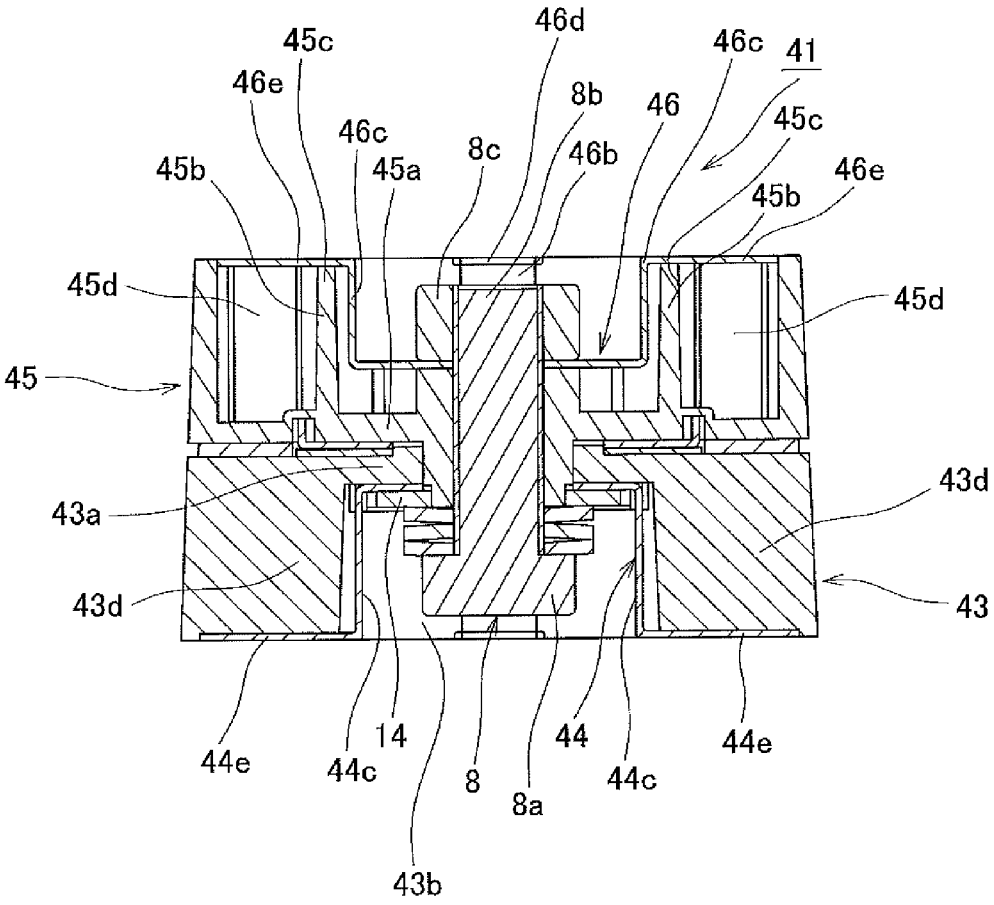
Fig. 21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ROTARY UNIT APPARATUS AND ROTATION SUPPORTING APPARATUS

This application claims priority from Japanese Patent Application No. 2013-101717, filed May 13, 2013, the entire disclosure of which is incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to a rotary unit apparatus and a rotation supporting apparatus for supporting a flat-type television receiver, a flat-type display device or audio equipment, and so on, so as to make the latter rotatable in a horizontally right and left direction.

BACKGROUND ART

As a rotary unit apparatus, which supports a flat-type television receiver (which is referred to as television in the following) on a mounting stand, so as to make the latter rotatable in a horizontally right and left direction, the one described in JP Laid-Open Patent Application Publication No. 2006-227390 (which is referred to as Patent Document 1 in the following).

A rotary unit apparatus of television according to Patent Document 1 as described above comprises a pole attached to a monitor mounting stand for supporting the television; an upper bush mounted in contact with a lower surface of the pole; an attaching base mounted in contact with a lower surface of the upper bush; a lower bush mounted in contact with a lower surface of the attaching base; a spring plate mounted in contact with a lower surface of the lower bush; a back plate mounted in contact with a lower surface of the spring plate; and a fixing bolt for mounting the upper bush, the attaching base, the lower bush, the spring plate and the back plate are to the pole, so as to bring all the components together.

In a rotary unit apparatus as described in Patent Document 1 as described above, a lower bush is merely in contact with a lower side of a top plate of an attaching base, as shown in particular in FIGS. **9** and **13**. Therefore, in case that a television receives a pressure downward or upward from either right or left end portion, it is possible that the top plate escapes from the lower bush, or that the top plate is broken.

SUMMARY OF THE INVENTION

The present invention is made to solve the above-mentioned problems, and an object of the invention is to provide a rotary unit apparatus and a rotation supporting apparatus used for television, etc., with a simple structure, which can generate an adequate friction torque and has a strength enough to prevent an escape and fracture during its use, even if it is made of aluminum die-cast material or synthetic resin article.

To achieve the above-mentioned object, the present invention according to the first aspect comprises a fixed cylindrical body attached to a base member, wherein the fixed cylindrical body comprises: an upper disc portion; a lower interior cylindrical body surrounding an insertion hole provided on the upper disc portion, wherein the lower interior cylindrical body is provided to hang down perpendicular to the upper disc portion; a lower exterior cylindrical body provided on an outer circumference of the lower interior cylindrical body spaced apart at a predetermined interval from the lower exterior cylindrical body, the lower interior cylindrical body being provided to hang down perpendicular to the upper disc portion; and a plurality of outer ribs connecting the lower interior cylindrical body and the lower exterior cylindrical body. The present invention according to the first aspect further comprises a rotary cylindrical body attached to a supporting member, wherein the rotary cylindrical body comprises: a lower disc portion; an upper interior cylindrical body erected upward from the lower disc portion; an upper exterior cylindrical body provided on an outer circumference of the upper interior cylindrical body spaced apart at a predetermined interval from the upper interior cylindrical body and erected upward from the lower disc portion; a plurality of outer ribs connecting the upper interior cylindrical body and the upper exterior cylindrical body; and a lower cylindrical body provided so as to hang down perpendicular to the lower disc portion and to pass through the insertion hole provided on the upper disc portion, so that the lower cylindrical body protrudes to the inside of the lower interior cylindrical body. The present invention according to the first aspect further comprises a hinge shaft passing through the lower cylindrical body, wherein the hinge shaft connects the rotary cylindrical body and the fixed cylindrical body in a relatively rotatable manner; and a friction mechanism mounted on the hinge shaft so as to generate a friction torque between the fixed cylindrical body and the rotary cylindrical body, during rotation of the rotary cylindrical body. The present invention according to the first aspect is thus characterized in that a reinforcing member is provided in a direct and/or indirect contact with the upper disc portion inside the lower interior cylindrical body of the fixed cylindrical body and/or the lower disc portion inside the lower interior cylindrical body of the rotary cylindrical body, and locking pieces provided on the reinforcing member are locked by the lower interior cylindrical body and/or the upper interior cylindrical body.

The invention according to the second aspect is characterized in that a hinge shaft comprises a male screw portion and a nut portion, and a male screw portion is screwed into a female screw hole provided on the lower cylindrical body of the rotary cylindrical body.

The invention according to the third aspect is characterized in that a friction mechanism comprises a first friction washer, wherein a hinge shaft is inserted into an insertion hole of the first friction washer and the first friction washer is locked by a upper disc portion of a fixed cylindrical body; a second friction washer in contact with the first friction washer, wherein the hinge shaft is inserted into an insertion hole of the second friction washer and the second friction washer is locked by said upper disc portion of said fixed cylindrical body; a third friction washer in direct or indirect contact with a lower surface side of the upper disc portion, wherein the third friction washer is fixed to the lower cylindrical body; and elastic means in contact with said third friction washer, wherein the elastic means are mounted on the hinge shaft.

The invention according to the fourth aspect is characterized in that a spacer washer is provided between an upper disc portion of a fixed cylindrical body and a lower disc portion of a rotary cylindrical body, wherein the spacer washer comprises an insertion hole and it is fixed to the upper disc portion, by housing the first friction washer and the second friction washer into the insertion hole of the spacer washer.

The invention according to the fifth aspect is characterized in that a reinforcing member comprises a plurality of locking pieces provided by folding edges of the reinforcing member, and locking portions of the locking pieces are locked by locking ribs provided on an inner wall of a lower interior cylindrical body and/or an interior cylindrical body, so as to structure the reinforcing member.

The invention according to the sixth aspect is characterized in that a reinforcing member comprises a plurality of locking pieces provided by folding edges of the reinforcing member, and locking portions of the locking pieces are locked by an open end side of a lower interior cylindrical body and/or an upper interior cylindrical body so as to structure the reinforcing member.

The invention according to the seventh aspect is characterized in that a reinforcing member comprises a plurality of locking pieces provided by folding edges of the reinforcing member, and locking portions of said locking pieces are locked by an open end side of a lower interior cylindrical body and/or an upper interior cylindrical body, and/or said outer ribs so as to structure the reinforcing member.

The invention according to the eighth aspect is characterized in that a reinforcing member comprises a plurality of locking pieces provided by folding edges of the reinforcing member, and locking portions of the locking pieces are locked by locking ribs provided on an inner wall of a lower interior cylindrical body and/or an upper interior cylindrical body, and/or said open end side of the lower interior cylindrical body and/or the upper interior cylindrical body so as to structure the reinforcing member.

The invention according to the ninth aspect is characterized in that the rotary unit apparatus according to either one of first to eighth aspects is used.

The invention is structured as described above, so that it serves as a rotary unit apparatus and a rotation supporting apparatus used for a heavy television, and it can generate a required friction torque with a structure as simple as possible, even in use of synthetic resin for a constituting element. Still further, a reinforcing member assures that adequate durability is sustained for the apparatus according to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a rotary unit apparatus according to the present invention, which is available for use;

FIG. **2** is a perspective view of a rotary unit apparatus according to the present invention;

FIG. **3** is a perspective view of a rotary unit apparatus according to the present invention, as seen from below;

FIG. **4** is an exploded perspective view of a rotary unit apparatus according to the present invention;

FIG. **5** is an exploded perspective view of a rotary unit apparatus according to the present invention, as seen from below;

FIG. **6** show a first reinforcing member of a rotary unit apparatus according to the present invention, FIG. **6**A being a perspective view thereof, and FIG. **6**B a plan view;

FIG. **7** is a plan view of a rotary unit apparatus according to the present invention;

FIG. **8** is a bottom view of a rotary unit apparatus according to the present invention;

FIG. **9** is a longitudinal sectional view of a rotary unit apparatus according to the present invention;

FIG. **10** is a perspective view showing another embodiment of a rotary unit apparatus according to the present invention;

FIG. **11** is a perspective view of a rotary unit apparatus as shown in FIG. **10**, wherein the perspective view is seen from below;

FIG. **12** is a perspective view of a second reinforcing member of a rotary unit apparatus as shown in FIG. **10**;

FIG. **13** is a perspective view of a third reinforcing member of a rotary unit apparatus as shown in FIG. **10**;

FIG. **14** is a longitudinal sectional view of a rotary unit apparatus as shown in FIG. **10**;

FIG. **15** is a perspective view showing still other embodiment of a rotary unit apparatus according to the present invention;

FIG. **16** is a perspective view of a rotary unit apparatus as shown in FIG. **15**, wherein the perspective view is seen from below;

FIG. **17** a longitudinal sectional view of a rotary unit apparatus as shown in FIG. **15**;

FIG. **18** is a perspective view showing still other embodiment of a rotary unit apparatus according to the present invention;

FIG. **19** is a perspective view of a rotary unit apparatus as shown in FIG. **18**, the perspective view being seen from below;

FIG. **20** is a perspective view illustrating the state, in which a fourth reinforcing member and a fifth reinforcing member of a rotary unit apparatus as shown in FIG. **18** are used;

FIG. **21** a longitudinal sectional view of a rotary unit apparatus as shown in FIG. **18**.

EMBODIMENTS

In the following, reference is made to best modes of a rotary unit apparatus according to the present invention, based on the drawings. In the following reference is made to one of its uses, i.e. for a flat-type television being an example of a flat-type display apparatus, but the rotary unit apparatus according to the present invention is also applicable to a flat-type monitor television, a tablet-type display apparatus, audio equipment, etc. Accordingly, each reference to "television, etc." in this description and claims also implies a flat-type monitor television, tablet-type display apparatus, audio equipment, etc. as listed above, in addition to a flat-type television.

FIG. **1** is a perspective view illustrating an example of use of a rotary unit apparatus according to the present invention. According to FIG. **1**, a rotary unit apparatus **1** according to the present invention is used between a base member **4** and a bracket **5** of a rotation supporting apparatus **3** of a flat-type liquid crystal television **2**.

Embodiment 1

FIGS. **1** to **9** show Embodiment 1 of a rotary unit apparatus **1** according to the present invention. According to the drawings, the rotary unit apparatus **1** according to Embodiment 1 comprises a fixed cylindrical body **6** fixed to a base member **4**; a rotary cylindrical body **7** fixed to a bracket **5** side, wherein the bracket **5** is rotatably attached to the fixed cylindrical body **6** via a hinge shaft; a friction mechanism **9** mounted to the hinge shaft **8** so as to generate friction torque between the fixed cylindrical body **6** and the rotary cylindrical body **7**; and a reinforcing member **13** for preventing the fixed cylindrical body **6** and/or the rotary cylindrical body **7** from escaping and breaking.

A base member **4** has the shape of plate in a plane rectangular shape. Its shape and structure are not particularly limited, as long as a fixed cylindrical body **6** can be attached to the base member. The base member **4** is put on a mounting stand (not shown) of a television, etc. A bracket **5** comprises an attaching plate **5***a* attached to an upper portion of a rotary cylindrical body **7** and a supporting member **5***b* attached to the attaching plate **5***a*, wherein a television **2** is attached to the supporting member **5***b*. In the meantime, a shape and a structure of the bracket **5** are not limited to the ones of the embodiments. Brackets of various shapes and structures are conceivable.

A fixed cylindrical body **6** is made of aluminum die-cast or synthetic resin, and has a cylindrical shape. The fixed cylindrical body **6** comprises a lower interior cylindrical body **6***b* integrally formed with an upper disc portion **6***a* covering the top so as to hang down from the upper disc portion; a lower exterior cylindrical body **6***c* provided on the outside of the lower interior cylindrical body **6***b*, so as to likewise integrally hang down from the upper disc portion **6***a* concentrically with the lower interior cylindrical body **6***b*; and a plurality of outer ribs **6***d*, **6***d* . . . radially connecting the lower exterior cylindrical body **6***c* and the lower interior cylindrical body **6***b*. Following constituting elements are provided on the upper disc portion **6***a*: an insertion hole **6***e* provided concentrically with the lower interior cylindrical body **6***b;* a ring-shaped convex portion **6***f* provided on an upper surface circumference of the insertion hole **6***e*; arcuate groove portions **6***g*, **6***g* provided in opposed positions near an outer circumference of the upper disc portion **6***a*; four projecting portions **6***h*, **6***h* . . . provided at 90° intervals near the outer circumference of the upper disc portion **6***a;* and four locking hole portions **6***i*, **6***i* . . . provided at 90° intervals inside from the projecting portions **6***h*, **6***h* . . . . Moreover, some of the outer ribs **6***d*, **6***d* . . . , which are so selected that they are situated at 90° intervals, respectively have swollen portions, on each of which a female hole **6***j* is provided. On the other hand, locking ribs **6***k*, **6***k* . . . disposed at 90° intervals are provided to protrude from the inner wall of the lower interior cylindrical body **6***b* on the upper disc portion **6***a* side, wherein the locking ribs extend in circumferential direction.

A rotary cylindrical body **7** as well is made of aluminum die-cast or synthetic resin, and has a cylindrical shape. Its contour is substantially the same as that of a fixed cylindrical body **6**. A lower disc portion **7***a* is provided on a lower end side in the area facing an upper disc portion **6***a* of the fixed cylindrical body **6**. The rotary cylindrical body **7** further comprises an upper interior cylindrical body **7***b* formed integrally with the lower disc portion **7***a* so as to extend upward from the lower disc portion; an upper exterior cylindrical body **7***c* provided on the outside of the lower interior cylindrical body **7***b*, so as to likewise integrally extend upward from the lower disc portion **7***a* concentrically with the upper interior cylindrical body **7***b*; and a plurality of outer ribs **7***d*, **7***d* . . . radially connecting the upper exterior cylindrical body **7***c* and the upper interior cylindrical body **7***b*. Following constituting elements are provided on the upper disc portion **7***a*: a female screw hole **7***e* provided concentrically with the upper interior cylindrical body **7***b*; a lower cylindrical body **7***f* provided so as to further extend the female screw hole **7***e* downward; arcuate convex portions **7***g*, **7***g* provided in opposed positions near an outer circumference of the female screw hole **7***e*; four locking holes **7***h*, **7***h* . . . provided at 90° intervals near the outer circumference of the female screw hole **7***e*. Moreover, some of the outer ribs **7***d*, **7***d* . . . , which are so selected that they are situated at 90° intervals, respectively have swollen portions, on each of which a female hole **7***i* is provided. On the other hand, engaging portions **7***j*, **7***j* . . . are provided on a lower tip of a lower cylindrical body **7***f* by scrapping off surface areas at 90° intervals in four directions. Still further, a boss portion **7***k* having a flat top surface is provided around the female screw hole **7***e*, and four inner ribs **7***m*, **7***m* . . . are radially provided between the boss portion **7***k* and the upper interior cylindrical body **7***b*.

A hinge shaft **8** is e.g. made of SUS, and in this embodiment, it comprises a male screw portion **8***b* having a head portion **8***a* and a nut portion **8***c*. As shown in FIGS. **4**, **5** and **9**, the male screw portion **8***b* is inserted from below into a female screw hole **7***e* and screwed therewith. In this manner, the hinge shaft **8** is structured such that it connects a fixed cylindrical body **6** and a rotary cylindrical body **7** in a relatively rotatable manner. In the meantime, the hinge shaft **8** does not necessarily involve a bolt, but an ordinary hinge shaft can be used for this purpose, wherein the hinge shaft used connects the fixed cylindrical body **6** and the rotary cylindrical body **7** using other known methods such as caulking at the ends of the shaft. In this case, the female screw hole **7***e* can be replaced by an ordinary insertion hole. Still further, instead of caulking, a male screw portion can be provided on a part on which a nut portion is attached. In case of an ordinary hinge shaft, a detent means can be provided between the hinge shaft and a lower cylindrical body **7***f*, as necessary. The hinge shaft **8** in claims and specification of this invention implies both of the above-mentioned embodiments. In case that the male screw portion **8***b* of the hinge shaft **8** is screwed with the female screw hole **7***e* provided on the lower cylindrical body **7***f* of the rotary cylindrical body **7**, the hinge shaft **8** has a double nut effect together with a nut portion **8***c*, so as to prevent the nut portion **8***c* from loosening during use.

A friction mechanism **9** comprises, especially as shown in FIGS. **4**, **5** and **9**, a first friction washer **10** having an insertion hole **10***a* in an axial direction on a central portion of the first friction washer, wherein a male screw portion **8***b* of a hinge shaft **8** is inserted into the insertion hole, and wherein the first friction washer **10** is provided by inserting a ring-shaped convex portion **6***f* into the insertion hole **10***a*, while four locking pieces **10***b*, **10***b* . . . (which are formed by folding respective edges of the first friction washer **10** downward) are inserted into locking hole portions **6***i*, **6***i* . . . provided on an upper disc portion **6***a* of a fixed cylindrical body **6**, so as to respectively engage the locking hole portions; a second friction washer **11** having an insertion hole **11***a* in an axial direction on a central portion of the second friction washer, wherein the second friction washer **11** is provided in a pressurized contact with the first friction washer **10**, while four locking pieces **11***b*, **11***b* . . . (which are formed by folding respective edges of the friction washer **11** downward) are inserted into locking holes **7***h*, **7***h* . . . provided on a lower disc portion **7***a* of a rotary cylindrical body **7**, so as to respectively engage the locking holes; a spacer washer **12** having a large-diameter insertion hole **12***a* in an axial direction on a central portion of the spacer washer, wherein the spacer washer is provided between the upper disc portion **6***a* of the fixed cylindrical body **6** and the lower disc portion **7***a* of the rotary cylindrical body **7** by housing the first friction washer **10** and the second friction washer **11** into the insertion hole **12***a* and by fitting projecting portions **6***h*, **6***h* . . . provided on the upper disc portion **6***a* of the fixed cylindrical body **6** into locking holes **12***b*, **12***b* . . . of the spacer washer; a reinforcing member **13** being in pressurized contact with a bottom surface of the upper disc portion **6***a*, while a lower cylindrical body **7***f* (which extends from the rotary cylindrical body **7** and passes through an insertion hole **6***e* provided on the upper disc portion **6***a* of the fixed cylindrical body **6** so as to protrude from the insertion hole **6***e*) is inserted into an insertion hole **13***a* provided in an axial direction on a central portion of the reinforcing member; a third friction washer **14** having a deformed insertion hole **14***a*, wherein the third friction washer **14** is provided in pressurized contact with the reinforcing member **13**, while engaging portions **7***j* of the lower cylindrical body **7***f* engage with the deformed insertion hole **14***a*; and spring washers or dish springs **15**, **16**, **17** provided between a head portion **8***a* of the hinge shaft **8** and the third friction washer **14**, while the male screw portion **8***b* of the hinge shaft **8** is inserted into respective insertion holes **15***a*, **16***a*, **17***a*. In this manner, the friction mechanism **9** is so

structured that when a nut portion **8***c* of the hinge shaft **8** is fastened toward the male screw portion **8***b*, this leads to generation of friction torque between the first friction washer **10** and the second friction washer **11**, as well as between the reinforcing member **13** and the third friction washer **14**, in a rotation of the rotary cylindrical body **7** in a horizontal right and left direction. In the meantime, reference numerals **12***c*, **12***c* found on the spacer washer **12** denote notch portions for allowing arcuate convex portions **7***g*, **7***g* of the rotary cylindrical body **7** to escape.

In the meantime, locking pieces **13***b*, **13***b* . . . are provided at about 90° intervals on an outer circumference of a reinforcing member **13**, and locking portions **13***c*, **13***c* . . . provided on locking pieces **13***b*, **13***b* . . . are locked by locking ribs **6***k*, **6***k* . . . provided on an inner circumference of a lower interior cylindrical body **6***b* of a fixed cylindrical body **6**.

Still further, a friction mechanism **9** according to this embodiment has a compact and inexpensive structure, so that it has an advantage that it can be manufactured at a low cost. However, the structure of friction mechanism is not limited to the above-described, but various friction mechanisms of known or novel structure are conceivable. Moreover, a plurality of oil reservoir portions **10***c*, **10***c* . . . for reserving lubricating oil is radially provided on a first friction washer **10**, as well as a plurality of oil reservoir portions **11***c*, **11***c* . . . having the same function on a second friction washer **11**.

Still further, the structure of elastic means consisting of spring washers or dish springs **15**, **16**, **17** as in this embodiment realizes compact and inexpensive elastic means. However, the structure is not limited to the one as in this embodiment, but various combinations of spring washers and dish springs are conceivable.

In the following, reference is made to steps for assembling the rotary unit apparatus **1**. First, the dish spring **17**, the dish spring **16**, the dish spring **15**, the third friction washer **14**, and then the reinforcing member **13** are lightly press-fitted into the male screw portion **8***b* of the hinge shaft **8**, in this order. Before or after this step, the first friction washer **10** is lightly press-fitted into the top of the upper disc portion **6***a* of the fixed cylindrical body **6**, and the spacer washer **12** is mounted on the top of the upper disc portion **6***a*. Furthermore, the second friction washer **11** is lightly press-fitted into the bottom surface of the lower disc portion **7***a* of the rotary cylindrical body **7**, and then the rotary cylindrical body **7** and the second friction washer **11** as combined are superposed above the fixed cylindrical body **6**, and the lower cylindrical body **7***f* is inserted into the insertion hole **6***e* of the fixed cylindrical body **6**. At this time, the deformed insertion hole **14***a* of the third friction washer **14** is lightly press-fitted into the engaging portions **7***j*.

Next, when the male screw portion **8***b* of the hinge shaft **8** is screwed into the female screw hole **7***e* of the lower cylindrical body **7***f*, the first friction washer **10**, the second friction washer **11**, the third friction washer **14** and the reinforcing member **13** are brought into pressurized contact with each other, by the resilient force of the dish springs **15**, **16**, **17**. At this time, the top of the male screw portion **8***b* protrudes upwards from the female screw hole **7***e* on the rotary cylindrical body **7** side. Then the nut portion **8***c* is screwed with a part of the male screw portion **8***b* protruding from the female screw hole **7***e* and fastened, so that the assembly of the rotary unit apparatus **1** is accomplished. Next, the fixed cylindrical body **6** is fixed to the base member **4** by screwing attaching screws (not shown) into corresponding female holes **6***j*, **6***j* . . . , and the attaching plate **5***a* of the bracket **5** is fixed by screwing attaching screws (not shown) into corresponding female holes **7***i*, **7***i* . . . , so that the assembly of the rotation supporting apparatus **3** is accomplished. Accordingly, friction torque is generated by screwing the male screw portion **8***b* of the hinge shaft **8** into the female screw hole **7***e* of the lower cylindrical body **7***f*, and it is fastened with the nut portion **8***c* for preventing it from loosening.

The television **2** is then attached to the supporting member **5***b* of the bracket **5**, the base member **4** is put on a mounting stand (not shown). When the viewer tries to rotate the television **2** in horizontal right and left direction from the above-mentioned state, the rotary cylindrical body **7** rotates with respect to the fixed cylindrical body **6**, therefore the television **2** rotates in right and left direction via the rotary unit apparatus **1**. In this manner, the display can be turned in any direction desired by the viewer on each occasion. At this time, the rotational operation assures an ideal operation feeling for the operator as well as a stable support at stopping position, by the friction mechanism **9**, since the second friction washer **11** and the third friction washer **14** rotating together with the rotary cylindrical body **7** generate friction torque between the first friction washer **10** and the reinforcing member **13**, as fixed to the fixed cylindrical body **6**. Moreover, the rotational angle is regulated by the arcuate convex portions **7***g*, **7***g* of the rotary cylindrical body **7**, which move inside the arcuate groove portions **6***g*, **6***g* of the fixed cylindrical body **6**. In this manner, the arcuate groove portions **6***g*, **6***g* and the arcuate convex portions **7***g*, **7***g* constitute altogether stopper means.

Furthermore, though the spacer washer **12** does not create the friction torque, is provided in order to prevent the upper disc portion **6***a* of the fixed cylindrical body **6** and the lower disc portion **7***a* of the rotary cylindrical body **7** from a contact with each other so as to cause damages, with forces from outside being applied in rotation or at rest.

Still further, even if unreasonable force is applied on the rotary unit apparatus **1** by pushing the top end portions on the right or left hand side of the television **2** in up- and down directions, the locking portions **13***c*, **13***c* . . . of the reinforcing member **13** are locked by corresponding locking ribs **6***k*, **6***k* . . . , so that the applied force is dispersed to the lower interior cylindrical body **6***b* of the fixed cylindrical body **6**. In this manner, it is possible to prevent the upper disc portion **6***a* from escaping downward or breaking in the area of the third friction washer **14**.

Embodiment 2

FIGS. **10** to **14** show another embodiment, i.e. Embodiment 2. According to the drawings, a rotary unit apparatus **21** according to Embodiment 2 under this section differs from a rotary unit apparatus **1** according to Embodiment 1 merely in structure of reinforcing member(s), and otherwise it is identical to the rotary unit apparatus **1**. Therefore, no detailed descriptions are made to the entire apparatus. Moreover, those with identical reference numerals have an identical structure, as well as identical operation and effect.

Reinforcing members according to Embodiment 2 as described below include a first reinforcing member **24** attached to the fixed cylindrical body **23** side, and a second reinforcing member **26** attached to the rotary cylindrical body **25** side. The first reinforcing member **24** is identical to a reinforcing member **13** according to Embodiment 1, in that the former is provided between a lower side of an upper disc portion **23***a* of the fixed cylindrical body **23** and a third friction washer **14**, and comprises an insertion hole **24***a* in which a male screw portion **8***b* of a hinge shaft **8** is inserted. However, the first reinforcing member **24** according to Embodiment 2 differs from the reinforcing member **13** according to

Embodiment 1, in that three locking pieces **24***b*, **24***b* . . . of the first reinforcing member **24** extend up to the open end side at a bottom end portion of a lower interior cylindrical body **23***b*, and that respective locking portions **24***c*, **24***c* . . . provided on the locking pieces **24***b*, **24***b* . . . are locked by corresponding locking concave portions **23***c*, **23***c* . . . provided on the open end side at a bottom end portion of a lower interior cylindrical body **23***b*.

A second reinforcing member **26** is provided between an upper surface side of a lower disc portion **25***a* of a rotary cylindrical body **25** and a nut portion **8***c* of a hinge shaft **8**. The second reinforcing member **26** has an insertion hole **26***a* in which a male screw portion **8***b* of a hinge shaft **8** is inserted; furthermore, four locking pieces **26***b*, **26***b* . . . are provided to extend upward from the outer circumference of the second reinforcing member **26**. Respective locking portions **26***c*, **26***c* . . . provided on the locking pieces **26***b*, **26***b* . . . are locked by corresponding locking concave portions **25***c*, **25***c* . . . provided on the open end side at an upper end portion of an upper interior cylindrical body **25***b* of the rotary cylindrical body **25**.

Accordingly, even if unreasonable force is applied on the upper disc portion **23***a* and the lower disc portion **25***a*, the applied force is dispersed to the lower interior cylindrical body **23***b* of the fixed cylindrical body **23** and upper interior cylindrical body **25***b* of the rotary cylindrical body **25**, as described under Embodiment 1. In this manner, the rotary unit apparatus **21** can more effectively prevent on the upper disc portion **23***a* and the lower disc portion **25***a* from escaping downward or breaking in the area of the male screw portion **8***b*.

Embodiment 3

FIGS. **15** to **17** show another embodiment, i.e. Embodiment 3. According to the drawings, a rotary unit apparatus **31** according to Embodiment 3 under this section differs from a rotary unit apparatus **1** according to Embodiment 1 merely in a reinforcing member additionally attached to a rotary cylindrical body, and otherwise it is identical to the rotary unit apparatus **1**. Therefore, no detailed descriptions are made to the entire apparatus. Moreover, those with identical reference numerals have an identical structure, as well as identical operation and effect.

Reinforcing members of a rotary unit apparatus **31** according to Embodiment 3 include a first reinforcing member **34** attached to the fixed cylindrical body **33** side, and a second reinforcing member **36** attached to the rotary cylindrical body **35** side. The first reinforcing member **34** is identical to a reinforcing member **13** according to Embodiment 1. However, the first reinforcing member **34** is provided between a third friction washer **14** and an upper disc portion **33***a* of the fixed cylindrical body **33**. The first reinforcing member **34** comprises an insertion hole **34***a* in an axial direction on a central portion, wherein a male screw portion **8***b* of a hinge shaft **8** is inserted into the insertion hole; furthermore, four locking pieces **34***b*, **34***b* . . . are provided at 90° intervals, and respective locking portions **34***c*, **34***c* . . . provided on the locking pieces **34***b*, **34***b* . . . are locked by corresponding locking concave portions **33***c*, **33***c* . . . provided on the open end side at a bottom end portion of a lower interior cylindrical body **33***b* of the fixed cylindrical body **33**.

A second reinforcing member **36** is provided between an upper surface side of a lower disc portion **35***a* of a rotary cylindrical body **35** and a nut portion **8***c* of a hinge shaft **8**. The second reinforcing member **36** has an insertion hole **36***a* in which a male screw portion **8***b* of a hinge shaft **8** is inserted; furthermore, three locking pieces **36***b*, **36***b* . . . are provided to extend upward from the outer circumference of the second reinforcing member **36**. Respective locking portions **36***c*, **36***c* . . . provided on the locking pieces **36***b*, **36***b* . . . are locked by corresponding locking concave portions **35***c*, **35***c* . . . provided on the open end side at an upper end portion of an upper interior cylindrical body **35***b* of the rotary cylindrical body **35**.

Accordingly, even if unreasonable force is applied on the upper disc portion **33***a* of the fixed cylindrical body **33** and the lower disc portion **35***a* of the rotary cylindrical body **35**, the applied force is dispersed to the lower interior cylindrical body **33***b* of the fixed cylindrical body **33** and the upper interior cylindrical body **35***b* of the rotary cylindrical body **35**, as described under Embodiment 1. In this manner, the rotary unit apparatus **31** according to Embodiment 3 can more effectively prevent the upper disc portion **33***a* and the lower disc portion **35***a* from escaping downward or breaking in the area of the male screw portion **8***b*.

Embodiment 4

FIGS. **18** to **21** show another embodiment, i.e. Embodiment 4. According to the drawings, a rotary unit apparatus **41** according to Embodiment 4 under this section differs from a rotary unit apparatus **1** according to Embodiment 1 merely in structure of reinforcing member(s), and otherwise it is identical to the rotary unit apparatus **1**. Therefore, no detailed descriptions are made to the entire apparatus. Moreover, those with identical reference numerals have an identical structure, as well as identical operation and effect.

Reinforcing members of a rotary unit apparatus **41** according to Embodiment 4 include a first reinforcing member **44** attached to the fixed cylindrical body **43** side, and a second reinforcing member **46** attached to the rotary cylindrical body **45** side. The first reinforcing member **44** is identical to a reinforcing member **13** according to Embodiment 1, in that the former is provided between a lower side of an upper disc portion **43***a* of the fixed cylindrical body **43** and a third friction washer **14**, and comprises an insertion hole **44***a* in which a male screw portion **8***b* of a hinge shaft **8** is inserted. However, the first reinforcing member **44** according to Embodiment 4 differs from the reinforcing member **13** according to Embodiment 1, in that two locking pieces **44***b*, **44***b* and two locking pieces **44***c*, **44***c* of the first reinforcing member **44**, wherein the former have a different shape from the latter, extend up to the open end side at a bottom end portion of a lower interior cylindrical body **43***b*, and that respective locking portions **44***d*, **44***d* provided on the locking pieces **44***b*, **44***b* are locked by corresponding locking concave portions **43***c*, **43***c* provided on the open end side at a bottom end portion of a lower interior cylindrical body **43***b*, while respective locking portions **44***e*, **44***e* provided on the locking pieces **44***c*, **44***c* are locked by the open end side at a lower end portion of the lower interior cylindrical body **43***b*, as well as outer ribs **43***d*, **43***d*.

A second reinforcing member **46** is provided between an upper surface side of a lower disc portion **45***a* inside a lower interior cylindrical body **43***b* of a rotary cylindrical body **45** and a nut portion **8***c* of a hinge shaft **8**. The second reinforcing member **46** is identical to a reinforcing member **26** according to Embodiment 2, in that the former has an insertion hole **46***a* in which a male screw portion **8***b* of a hinge shaft **8** is inserted. However, the second reinforcing member **46** according to Embodiment 4 differs from the reinforcing member **26** according to Embodiment 2, in that one locking piece **46***b* and two locking pieces **46***c*, **46***c*, wherein the former has a differ-

ent shape from the latter, extend up to the open end side at an upper end portion of an upper interior cylindrical body **45***b*, and that a locking portion **46***d* provided on the locking piece **46***b* is locked by a locking concave portion **45***c* provided on the open end side at a bottom end portion of an upper interior cylindrical body **45***b*, while respective locking portions **46***e*, **46***e* provided on the remaining locking pieces **46***c*, **46***c* are locked by the open end side at a lower end portion of the upper interior cylindrical body **45***b*, as well as outer ribs **45***d*, **45***d*.

Accordingly, even if unreasonable force is applied on the upper disc portion **43***a* of the fixed cylindrical body **43** and the lower disc portion **45***a* of the rotary cylindrical body **45**, the applied force is dispersed to the lower interior cylindrical body **43***b* of the fixed cylindrical body **43** and the outer ribs **43***d*, **43***d*, as well as the upper interior cylindrical body **45***b* of the rotary cylindrical body **45** and the outer ribs **45***d*, **45***d*, as described under Embodiment 1. In this manner, the rotary unit apparatus **41** according to Embodiment 4 can more effectively prevent on the upper disc portion **43***a* and the lower disc portion **45***a* from escaping downward or breaking in the area of the male screw portion **8***b*.

In the meantime, reinforcing member(s) can be provided between elastic means consisting of spring washers or dish springs, in each of the above-described embodiments. Furthermore, a reinforcing member provided on the rotary cylindrical body side allows for an optional interposition of washer between the reinforcing member itself and a nut portion.

Still further, various combinations of reinforcing members, i.e. the one provided on the fixed cylindrical body side and the one provided on the rotary cylindrical body side, are not limited to the combinations described in the above-described embodiments. Other appropriate combinations are also possible.

The present invention is structured as in the foregoing, so that it is suitable for use in a rotary unit apparatus which is applicable to a rotation supporting apparatus for a flat-type television receiver, a flat-type display device or audio equipment, and so on.

What is claimed is:

1. A rotary unit apparatus comprising a fixed cylindrical body attached to a base member, said fixed cylindrical body comprising: an upper disc portion; a lower interior cylindrical body surrounding an insertion hole provided on said upper disc portion, said lower interior cylindrical body being provided to hang down perpendicular to said upper disc portion; a lower exterior cylindrical body provided on an outer circumference of said lower interior cylindrical body spaced apart at a predetermined interval from said lower exterior cylindrical body, said lower interior cylindrical body being provided to hang down perpendicular to said upper disc portion; and a plurality of outer ribs connecting said lower interior cylindrical body and said lower exterior cylindrical body;

a rotary cylindrical body attached to a supporting member, said rotary cylindrical body comprising: a lower disc portion; an upper interior cylindrical body erected upward from said lower disc portion; an upper exterior cylindrical body provided on an outer circumference of said upper interior cylindrical body spaced apart at a predetermined interval from said upper interior cylindrical body and erected upward from said lower disc portion; a plurality of outer ribs connecting said upper interior cylindrical body and said upper interior cylindrical body; and a lower cylindrical body provided so as to hang down perpendicular to said lower disc portion and to pass through said insertion hole provided on said upper disc portion, said lower cylindrical body protruding to the inside of said lower interior cylindrical body;

a hinge shaft passing through said lower cylindrical body, said hinge shaft connecting said rotary cylindrical body and said fixed cylindrical body in a relatively rotatable manner;

a friction mechanism comprising a first friction washer, said hinge shaft being inserted into an insertion hole of said first friction washer and said first friction washer being locked by said upper disc portion of said fixed cylindrical body; a second friction washer in contact with said first friction washer, said hinge shaft being inserted into an insertion hole of said second friction washer and said second friction washer being locked by said upper disc portion of said fixed cylindrical body; a third friction washer in direct or indirect contact with a lower surface side of said upper disc portion, said third friction washer being fixed to said lower cylindrical body; and elastic means in contact with said third friction washer, said elastic means being mounted on said hinge shaft; and

a reinforcing member being provided in a direct and/or indirect contact with said upper disc portion inside said lower interior cylindrical body of said fixed cylindrical body and/or said lower disc portion inside said lower interior cylindrical body of said rotary cylindrical body, and locking pieces provided on said reinforcing member being locked by said lower interior cylindrical body and/or said upper interior cylindrical body.

2. The rotary unit apparatus according to claim **1**, wherein said hinge shaft comprises a male screw portion and a nut portion, and said male screw portion is screwed into a female screw hole provided on said lower cylindrical body of said rotary cylindrical body.

3. The rotary unit apparatus according to claim **1**, wherein a spacer washer is provided between said upper disc portion of said fixed cylindrical body and said lower disc portion of said rotary cylindrical body, said spacer washer comprising an insertion hole and being fixed to said upper disc portion, by housing said first friction washer and said second friction washer into said insertion hole of said spacer washer.

4. The rotary unit apparatus according to claim **1**, wherein said reinforcing member comprises a plurality of locking pieces provided by folding edges of said reinforcing member, and locking portions of said locking pieces are locked by locking ribs provided on an inner wall of said lower interior cylindrical body and/or said upper interior cylindrical body, so as to structure said reinforcing member.

5. The rotary unit apparatus according to claim **1**, wherein said reinforcing member comprises a plurality of locking pieces provided by folding edges of said reinforcing member, and locking portions of said locking pieces are locked by an open end side of said lower interior cylindrical body and/or said upper interior cylindrical body, so as to structure said reinforcing member.

6. The rotary unit apparatus according to claim **1**, wherein said reinforcing member comprises a plurality of locking pieces provided by folding edges of said reinforcing member, and locking portions of said locking pieces are locked by an open end side of said lower interior cylindrical body and/or said upper interior cylindrical body, and/or said outer ribs, so as to structure said reinforcing member.

7. The rotary unit apparatus according to claim **1**, wherein said reinforcing member comprises a plurality of locking pieces provided by folding edges of said reinforcing member, and locking portions of said locking pieces are locked by locking ribs provided on an inner wall of said lower interior cylindrical body and/or said upper interior cylindrical body, and/or said open end side of said lower interior cylindrical

body and/or said upper interior cylindrical body, so as to structure said reinforcing member.

8. A rotation supporting apparatus, comprising the rotary unit apparatus according claim **1**.

9. A rotation supporting apparatus, comprising the rotary unit apparatus according claim **2**.

10. A rotation supporting apparatus, comprising the rotary unit apparatus according claim **3**.

11. A rotation supporting apparatus, comprising the rotary unit apparatus according claim **4**.

12. A rotation supporting apparatus, comprising the rotary unit apparatus according claim **5**.

13. A rotation supporting apparatus, comprising the rotary unit apparatus according claim **6**.

14. A rotation supporting apparatus, comprising the rotary unit apparatus according claim **7**.

* * * * *